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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/665,335	09/18/2003	Alfred I-Tsung Pan	200313618-1	5438

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EXAMINER

PERT, EVAN T

ART UNIT	PAPER NUMBER
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2826

DATE MAILED: 02/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/665,335

Applicant(s)

PAN ET AL.

Examiner

Evan Pert

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 18 September 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 13, 14 and 16-42 is/are rejected.
- 7) ☒ Claim(s) 11, 12 and 15 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>0903</u> .  | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 4-10, 13-14, 16-35, 37-38 and 41-43 are rejected under 35 U.S.C. 102(e) as anticipated by Kirkor et al. (US 2004/0262582 A1) in view of Filas et al. (US 6,741,019), (wherein Filas et al. is relied on only as a teaching reference for teaching a universal fact in Kirkor et al.):.

#### Implicit disclosure of claim limitation drawn to "aspect ratio" [MPEP 2144.01]

The Kirkor et al. reference does not explicitly use the term "aspect ratio," yet describes the use of carbon "nanotubes" in an ink for an "ink-jet printer" as "particularly advantageous" [0032]. In other words, the Kirkor et al. reference does not specifically describe their "advantageous nanotube" nanostructures as "having an aspect ratio of at least about 5:1 within a liquid carrier," even though the "nanotubes" in the Kirkor et al. reference implicitly meet this limitation:

What Kirkor et al. calls "nanotubes" are necessarily relatively long nanostructures "having an aspect ratio of at least about 5:1," and even necessarily meet an "aspect ratio of at least about 10:1," as evidenced by US Patent 6,741,019, which states that "carbon nanotubes feature a high aspect ratio (>1000)..." [col. 2, lines 47-48].

Therefore, the teaching of Kirkor et al. to "add carbon nanotubes" to ink-jettable ink is a teaching that anticipates adding "nanostructures having an aspect ratio of at least about 10:1" [MPEP 2144.01 implicit disclosure].

Regarding claims 1, 2, 4, 5, 6, 21, 22 and 23, Kirkor et al. discloses a printable composition (i.e. ink) printed onto a substrate and partially dried before fully dried, comprising a liquid carrier (i.e. solvent per [0021]) and a plurality of nanostructures that implicitly have an aspect ratio of at least about 5:1 within the liquid carrier [i.e. carbon "nanotubes" that "have an aspect ratio >1000" according to the Filas et al. reference].

Regarding claim 7, the nanotubes are carbon without hydrogen bonds, so these nanotubes are technically "inorganic" (e.g. see dictionary.com)

Regarding claim 8, the nanostructures are doped (e.g. wherein "doped" means adulterated) [0030].

Regarding claims 9, 10, 13, 24, 25 and 31, the composition (i.e. ink) optionally comprises a "surfactant" per [0020].

Regarding claim 14, the ink can comprise a molecular precursor such as an "enzyme" per [0030] to [0031].

Regarding claims 16 and 19, the wt% claimed is set forth in the example at [0049].

Regarding claim 17, the composition includes a colorant (i.e. "dye or pigment" per [0020]).

Regarding claim 18, 37 and 38, the liquid carrier is a liquid vehicle (such as water) and the printable composition is usable in an "ink-jet printer" [0032].

Regarding claim 20, "water" per [0021] inherently "has a boiling point greater than 90°C."

Regarding claims 26, 32, the substrate is "glass," for example [0023].

Regarding claims 28-30, in view of nanotubes implicitly having an aspect ratio of at least about 10:1, the "method of forming a conductive path" claimed is anticipated by paragraph [0049] of the Kirkor et al. reference.

Regarding claim 35, the Kirkor et al. reference discloses "capacitor" for example [0030].

Regarding claim 41, the system as claimed is disclosed as an ink jet printer [0033] with ink having "nanotubes" therein (i.e. nanostructures having an aspect ratio of at least about 10:1), a liquid vehicle such as water [0021], and a "surfactant" [0020] (which is a stabilizing agent configured to inhibit agglomeration of the plurality of nanotubes in the ink).

Regarding claims 42 and 43, the Kirkor et al. reference discloses a printable composition (i.e. ink) comprising a liquid carrier (e.g. water per [0021]), a plurality of nanotubes in the water (wherein the nanotubes are implicitly nanostructures having an aspect ratio of at least about 10:1) and a stabilizing agent and/or molecular precursor ([0020] to [0024]).

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 27, 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kirkor et al., as applied to claims 21 and 28 above, and further in view of the Background to Kirkow et al..

Kirkor et al. is silent about sintering the ink with nanotubes, and teaches that heating as in the prior art is unnecessary in their invention.

Yet, the Kirkor et al. reference also discloses that a heat treatment at temperatures from 50°C to several hundred degrees Celsius attains "high conductivity" of conductive inks that have been applied in the prior art.

Therefore, it would have been obvious to one of ordinary skill in the art to heat the conductive film containing nanotubes in Kirkor et al., at various experimental temperatures, such as "up to several hundred degrees Celsius," motivated to "attain high conductivity" as known in the prior art, wherein "sintering" is inherently a description of a phase change from heating that changes conductivity.

4. Claims 36, 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kirkor et al., as applied to claims 35 and 38 above, and further in view paragraph [0032] of Kirkor et al. which discloses that:

"...ink jet printers require that the particulates must be small in order to avoid clogging the printer nozzle. Therefore, the use of nanotubes is particularly advantageous when a continuous ink-jet printer is used to print conductive traces."

Kirkor et al. is silent about the width of the printed conductive traces being "15 um to about 100 um" and that the orifice of the ink-jet printhead is about "15um to 100um" or that the nanotubes have a length that is "from about 5% to about 80% of the ink-jet printhead orifice size."

Yet, it would have been obvious to use an orifice size greater than nanotube length [0032], and experiment to find appropriate orifice sizes, motivated to avoid clogging of the printhead taught by Kirkor et al.. One of ordinary skill in the art would be motivated to size printed conductor paths in accordance with the desired current-carrying capacity of the paths, and would want to size the ink-jet printhead orifice larger than the nanotube lengths, motivated to avoid clogging as taught by Kirkor et al.. [MPEP 2144].

Furthermore, the courts have held that a mere change in dimension over the prior art is not patentable unless an unexpected result is demonstrated, for example, [MPEP 2144.04(IV)(A)].

### ***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 3 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim contains subject matter that was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention.

Additionally, the specification is objected to for this deficiency in guidance of making a "printable composition" including "nanobelts, nanoplates or nanodiscs."

Applicant does not enable one of skill in the art to form a "printable composition" including "nanobelts, nanoplates or nanodiscs." Printable compositions including nanostructures that are not nanotubes or nanorods are not enabled by the specification because the only 2 examples are ZnO nanowires, and no guidance for forming "nanobelts, nanoplates or nanodiscs" as part of a "printable composition" is given.

***Allowable Subject Matter***

6. Claims 11, 12, and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter:

8. Applicant's "composition" can be distinguished from prior art by a "liquid carrier having nanostructures therein, the nanostructures having an aspect ratio of at least about 5:1," wherein the "composition" includes a particular "stabilizing agent" and/or "molecular precursor," as claimed.



**Conclusion**

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Evan Pert whose telephone number is 571-272-1969. The examiner can normally be reached on M-F (7:30AM-3:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ETP  
February 6, 2005

  
**EVAN PERT**  
**PRIMARY EXAMINER**